

**A Long-term Study of the Effects of Granular and Bait Formulations of
Fipronil on the Suppression of Fire Ant Colonies
Granger Lake Dam, Williamson Co., Texas - 1997-2000**

Charles L. Barr, Extension Program Specialist-Fire Ant Project
Rody L. Best, Extension Assistant
Bill Summerlin, Urban Entomology Technician
Lisa Lennon, EA-IPM - Fire Ants, Travis/Williamson County
Nathan Riggs, EA-IPM - Fire Ants, Bexar County

Fipronil is an insecticide effective in extremely low concentrations. Some reports also show residual activity for over a year against red imported fire ants (*Solenopsis invicta* Buren) when applied as a broadcast granular toxicant. This test was designed to evaluate fipronil's effectiveness and residual activity both as a bait and as a granular material applied at three different rates.

Materials and Methods

The test was located on the earthen dam impounding Granger Lake, Williamson Co., Texas. The area is controlled by the U.S. Army Corps of Engineers and public access is strictly limited. The site is mowed two or three times per year and is not grazed or hayed. Soil is primarily a heavy, black clay with high shrink-swell properties.

Plots consisted of 150 x 235 foot rectangles (0.81 acres) with a 0.25 acre circular sampling area (59 foot radius) at the center. Pre-counts were made on 24 October 1997 using the minimal disturbance technique in which mounds were disturbed with a pointed tool handle until ants emerged in a defensive manner. Plot counts were arrayed from lowest to highest, divided into four equal replications and treatments assigned within replications so that the total number of mounds for each treatment (all four replications) was as equal as possible. Treatments included:

<u>Treatment</u>	<u>Lbs a.i./acre</u>	<u>Lbs. material/acre</u>	<u>Application method</u>
untreated	—	—	---
fipronil, 0.1% granules	0.0125	12.5	broadcast
fipronil, 0.1% granules	0.01875	18.5	broadcast
fipronil, 0.1% granules	0.0250	25.0	broadcast
fipronil, 0.0015% bait	0.0000225	1.5	broadcast
hydramethylnon 0.7% bait	0.0105	1.5	broadcast
50% chlorpyrifos	8.0	16.0	boom sprayer

Treatments were applied 31 October and 3 November 1997. Due to a shortage of granular material, only three replications of the 0.025 rate of fipronil were applied. Evaluations were conducted on 25 November 1997, 28 January, 14 April 1998, 7 January 1999 and 12 January 2000. For the first three evaluations, the first five mounds encountered when sampling were dug with a shovel and rated on a scale of 1-5 for the relative number of ants present with a multiplying factor of 5 if worker brood was observed. The remainder of the plot was evaluated using the minimal disturbance technique to count active mounds. Due to unfavorable weather conditions, meaningful brood ratings could only be made during the 25 November evaluation.

Results

Mound Evaluations

Mean number of active ant mounds per 0.25 acre plot (4 replications)

Treatment	Pre-count	1 month	3 months	5 months	14 months	27 months
untreated	16.00 a	32.00 a	17.50 a	8.25 a	18.50 a	21.50 a
chlorpyrifos	16.50 a	3.75 c	0.75 b	0.50 b	12.25 b	19.00 a
hydramethylnon	15.75 a	13.50 bc	1.50 b	0.50 b	12.00 b	16.50 a
fipronil 0.0125 G	16.00 a	20.50 ab	0.50 b	0.00 b	1.75 d	5.75 b
fipronil 0.01875 G	16.00 a	22.00 ab	1.50 b	0.50 b	0.00 d	4.00 b
fipronil 0.0250 G*	16.00 a	21.33 ab	0.67 b	1.00 b	1.33 d	4.00 b
fipronil bait	15.75 a	15.50 b	0.50 b	1.25 b	7.00 c	6.00 b
F	8.09	3.03	16.66	7.04	14.02	6.72
P	0.0001	0.0236	0.0001	0.0003	0.0001	0.0004
R ²	0.8107	0.6159	0.8981	0.7885	0.8813	0.8076

* Only 3 replications were applied due to insufficient product

Data analyzed using SAS GLM procedure (due to unequal sample size) with means separated using Duncan's Multiple Range Test. Means in the same column followed by different letters are significantly different ($P < 0.05$)

Brood Rating (25 November 1997 only)

Ratings of first five active mounds found in plots

-----fipronil-----

	untreated	0.0125	0.0188	0.025	bait	Amdro	Dursban
Total rating	291	197	125	114	53	217	47
Number mounds*	20	20	20	19	6	20	15
Mean rating	14.55 a	9.85 ab	6.25 bc	10.74 ab	5.17 bc	10.85 ab	3.13 c

* some plots with fewer than 5 active mounds

Data analyzed using SAS General Linear Model procedure (due to unequal sample size) with means separated using Duncan's Multiple Range Test. Means followed by different letters are significantly different ($P < 0.05$).

Discussion

Active mound numbers actually increased from the date of treatment to the one month evaluation, except in chlorpyrifos-treated plots, due to rain and cooler temperatures. However, significant ($P<0.05$) differences were found between treatments. Chlorpyrifos, applied as Dursban 50WP, 8 lbs./acre active ingredient (the USDA quarantine mandated rate), resulted in 88% control compared to untreated plots within one month. The fipronil and Amdro baits had reduced active mound numbers by about 50% at this time.

By the three month evaluation, all treatments had significantly fewer active mounds than untreated plots. There were no statistical differences between any of the treatments. This pattern continued to the five month evaluation. Note that the number of active mounds found in untreated plots at the five-month evaluation dropped by about half compared to pre-count levels, due to an unusually warm, dry spring that preceded what became a record-breaking drought during the summer of 1998.

At 13 months post-treatment, the granular fipronil-treated plots averaged fewer than two mounds per plot with the 0.01875 lb/ac treatment showing 100% control. The 27 month post-treatment evaluation showed that both the Amdro and Dursban-treated plots were back to pre-treatment infestation levels. All the fipronil-treated plots, however, had significantly ($P<0.05$) fewer active mounds than untreated plots. These plots maintained 75-81% control versus untreated, Dursban-treated and Amdro-treated plots.

Mound condition at the time of the final evaluation indicated that large, healthy colonies were able to exist within the treated areas, so any further evaluations would only monitor natural re-infestation. Therefore, the test was discontinued, even with the fipronil treatments showing such a high level of control. Control of this magnitude and duration, particularly from a granular, contact insecticide, far exceeds any product performance tested in recent years.